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CLAIMS

1. An antireflection film comprising:

a transparent substrate and a fine particle layer that is placed on the surface of the transparent substrate and made from at least a single layer of fine particles,

wherein a surface of the transparent substrate and the fine particles are allowed to adhere to each other by at least an electrostatic interaction, while the bulk of the fine particle layer is set to have a refractive index lower than the refractive index of the transparent substrate.

2. The antireflection film according to claim 1, wherein the adhesion between the surface of the transparent substrate and the fine particles through the electrostatic interaction is achieved by forming a polymer electrolyte film made of a polymer electrolyte on the surface of the transparent substrate and using fine particles having a polarity different from the polarity that the polymer electrolyte film has.

3. The antireflection film according to claim 2, wherein the polymer electrolyte film is provided as a multi-layered film that is formed by sequential deposition not less than two kinds of polymer electrolytes that have mutually different polarities.

4. The antireflection film according to claim 2, wherein the polymer electrolyte film is formed as a film made of a cross-linked polymer electrolyte.

5. The antireflection film according to claim 1, wherein, in addition to the adhesion through the electrostatic

interaction, the adhesion between the surface of the transparent substrate and the fine particles is further made by a reinforcing adhesive means.

6. The antireflection film according to claim 5, wherein the reinforcing adhesive means is at least one means selected from the group consisting of a means for irreversibly coupling the surface of the transparent substrate and the fine particles chemically, a means for fusing the surface of the transparent substrate and the fine particles and a means for forming a polymer thin film on the surface of the fine particle layer.

7. An antireflection film comprising:

at least a transparent substrate, and a fine particle layer placed on the surface of the transparent substrate, having fine particles formed at least as a single layer, and having a bulk refractive-index that is lower than the refractive-index of the transparent substrate,

wherein the fine particle layer is a fine particle layer that is formed by allowing the fine particles to adhere to the substrate surface through an electrostatic interaction between the substrate surface and the fine particles, on another substrate surface, the antireflection film being formed by allowing this fine particle layer to be transferred on the transparent substrate.

8. The antireflection film according to claim 7, wherein the adhesion between said another substrate surface and the fine particles through the electrostatic interaction is carried out by forming a polymer electrolyte film made of a polymer

electrolyte on said another substrate surface, and using fine particles having a polarity that is different from the polarity that this polymer electrolyte film has.

9. The antireflection film according to claim 8, wherein the polymer electrolyte film is provided as a multi-layered film that is formed by sequential deposition not less than two kinds of polymer electrolytes that have mutually different polarities.

10. The antireflection film according to claim 8, wherein the polymer electrolyte film is formed as a film made of a cross-linked polymer electrolyte.

11. The antireflection film according to claim 7, wherein the adhesion between the fine particles of the fine particle layer and the surface of the transparent substrate is carried out by using at least one adhesive means selected from the group consisting of a means for irreversibly coupling the surface of the transparent substrate and the fine particles chemically, a means for fusing the surface of the transparent substrate and the fine particles, a means for forming a polymer thin film on the surface of the fine particle layer and a means for forming an adhesive layer on the surface of the transparent substrate and for allowing the fine particles to adhere to the adhesive layer.

12. The antireflection film according to claim 1, wherein the film thickness of the fine particle layer is set in a range of 50 nm to 300 nm.

13. The antireflection film according to claim 7, wherein

the film thickness of the fine particle layer is set in a range of 50 nm to 300 nm.

14. The antireflection film according to claim 1, wherein fine particles used for the fine particle layer are at least not less than one kind of fine particles selected from the group consisting of fine particles of polymers and silica fine particles, and the average particle size thereof is preferably set in a range of 50 nm to 300 nm.

15. The antireflection film according to claim 7, wherein fine particles used for the fine particle layer are at least not less than one kind of fine particles selected from the group consisting of fine particles of polymers and silica fine particles, and the average particle size thereof is preferably set in a range of 50 nm to 300 nm.

16. The antireflection film according to claim 1, wherein the fine particle layer is formed by at least two layers, with the film thickness of one layer being set in a range of 50 nm to 300 nm and the film thickness of the other layer being set in a range 1 nm to 50 nm.

17. The antireflection film according to claim 7, wherein the fine particle layer is formed by at least two layers, with the film thickness of one layer being set in a range of 50 nm to 300 nm and the film thickness of the other layer being set in a range 1 nm to 50 nm.

18. The antireflection film according to claim 1, wherein the volume percentage of the fine particles in the fine particle layer is set in a range of 10 volume % to 90 volume %.

19. The antireflection film according to claim 7, wherein the volume percentage of the fine particles in the fine particle layer is set in a range of 10 volume % to 90 volume %.

20. The antireflection film according to claim 1, wherein the bulk refractive index of the fine particle layer is set in a range of 1.05 to 1.70.

21. The antireflection film according to claim 7, wherein the bulk refractive index of the fine particle layer is set in a range of 1.05 to 1.70.

22. A process for producing an antireflection film comprising:

a charge applying process for applying a charge on a surface of the transparent substrate;

a fine particle layer forming process for applying to the transparent substrate a fine particle dispersant containing fine particles having a surface charge the polarity of which is reversed to the charge applied to the surface of the transparent substrate to form a fine particle layer; and

a cleaning process for cleaning the transparent substrate on which the fine particle layer is formed

23. The process for producing an antireflection film according to claim 22, wherein the charge applying process for applying a charge on the surface of the transparent substrate is a process which forms a polymer electrolyte film made of a multi-layered film formed by sequential deposition not less than two kinds of polymer electrolytes having mutually different polarities and/or a polymer electrolyte film made of

a cross-linked polymer electrolyte, on the surface of the transparent substrate.

24. A process for producing an antireflection film comprising:

a charge applying process for applying a charge on a substrate surface;

a fine particle layer forming process for applying to the transparent substrate a fine particle dispersant containing fine particles having a surface charge the polarity of which is reversed to the charge applied to the substrate surface to form a fine particle layer,

a cleaning process for cleaning the substrate on which the fine particle layer is formed; and

a transferring process for transferring the fine particle layer formed on the substrate onto the transparent substrate.

25. The process for producing an antireflection film according to claim 24, wherein, in the transferring process, the adhesive means between the fine particles in the fine particle layer and the surface of the transparent substrate is prepared as at least one means selected from the group consisting of a means for irreversibly coupling the surface of the transparent substrate and the fine particles chemically, a means for fusing the surface of the transparent substrate and the fine particles, a means for forming a polymer thin film on the surface of the fine particle layer and a means for forming an adhesive layer on the surface of the transparent substrate and for allowing the fine particles to adhere to the adhesive

layer.

26. A process for producing an antireflection film comprising:

a charge applying process for applying a charge on a substrate surface;

a fine particle layer forming process for applying to the transparent substrate a fine particle dispersant containing fine particles having a surface charge the polarity of which is reversed to the charge applied to the substrate surface to form a fine particle layer,

a cleaning process for cleaning the substrate on which the fine particle layer is formed,

a printing plate forming process for forming a printing plate by molding a printing plate material using the fine particle layer on the transparent substrate cleaned in the cleaning process as an original plate, and

a fine particle duplicate layer forming process for forming a fine particle duplicate layer on the transparent substrate by using the printing plate manufactured through the printing plate forming process.

27. The process for producing an antireflection film according to claim 24,

wherein the charge applying process for applying a charge to the substrate surface is a process for forming on the substrate surface a polymer electrolyte film made of a multi-layered film formed by sequential deposition at least not less than two kinds of polymer electrolytes having mutually

different polarities and/or a polymer electrolyte film made of a cross-linked polymer electrolyte.

28. The process for producing an antireflection film according to claim 25,

wherein the charge applying process for applying a charge to the substrate surface is a process for forming on the substrate surface a polymer electrolyte film made of a multi-layered film formed by sequential deposition at least not less than two kinds of polymer electrolytes having mutually different polarities and/or a polymer electrolyte film made of a cross-linked polymer electrolyte.

29. The process for producing an antireflection film according to claim 26,

wherein the charge applying process for applying a charge to the substrate surface is a process for forming on the substrate surface a polymer electrolyte film made of a multi-layered film formed by sequential deposition at least not less than two kinds of polymer electrolytes having mutually different polarities and/or a polymer electrolyte film made of a cross-linked polymer electrolyte.